

Emotion ontology: Mining in Social Media

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1 Introduction

1.1 Social Media

“We all make mistakes. But social media can frame those mistakes and display them infinitely.” - Unknown

A new era of social media, maybe is fit to describe a new civilization of humanity nowadays. At least more than half of the human population on the earth use and create the social media. Massive development of technology like world-wide webs and mobile apps are the reason behind why social media increases rapidly in the last couple decade.

Back in early 2001, Six Degrees was created and became one of pioneer of social media. It allowed the people to make a personal account and added others to their personal network. Then came up several other social media like Friendster and MySpace but in the process all of them were gone, lost to the competition.

In February 2004, Mark Zuckerberg and his partners Eduardo Saverin, Andrew McCollom, Dustin Moskovitz, and Chris Hughes made an exclusive social media platform for Harvard students which is known as Facebook. In the process, it became public in 2006 and spread out rapidly to the entire world and now it has become one of the popular social media and one of the biggest digital company in the world.

Several years after Facebook, there are several another social media which came out such as Twitter, Instagram, LinkedIn, Google+, Tumblr, WhatsApp and many more. Some of them couldn't survive because of several reasons like competition and popularity, while the others still exist until now, e.g. Twitter or Instagram.

Social media is very contributing in connecting people together from various backgrounds, communities, social and cultures. In social media people can share, interact, and influence others faster, easier, and more massively. People share their experiences, views, likes and dislikes on particular topic of their interest and explicitly, they contain a lot of useful information.

Along with its development, social media mining has become popular and necessary. Obtaining big data from user-generated content on social media in order to extract patterns, forming conclusions about users, acting upon the information, often for the purpose of advertising to users or conducting research, are several purposes of social data mining. After the data is received, it goes through social media analytics which is useful for sentiment analysis, and provides important social information about users' emotions on specific topics.[1]

<i>Category</i>	<i>Representative Sites</i>
Wiki	Wikipedia, Scholarpedia
Blogging	Blogger, LiveJournal, WordPress
Social News	Digg, Mixx, Slashdot
Micro Blogging	Twitter, Google Buzz
Opinion & Reviews	ePinions, Yelp
Question Answering	Yahoo! Answers, Baidu Zhidao
Media Sharing	Flickr ,Youtube
Social Bookmarking	Delicious, CiteULike
Social Networking	Facebook, LinkedIn, MySpace

Figure 1: Types of Social Media from "Mining Text Data" Book[2]

1.2 Emotion ontology

Emotions is part of human nature that can be considered as hereditary which can be categorized into two: basic and complex. Ekman defines basic emotions are joy, sadness, anger, fear, disgust and surprise, while the complex emotions are combination of two or more basic emotions that are experienced by a person at an instance.[3]

Meanwhile, (Aristotle 1028b5) ontology in his theory that reality is based on the substances of physical objects, not forms. 'What is being?' is just the question 'What is substance?'.[4]Before we define the emotion ontology, let's take a look the root of it.

Husserl's conception on the science of logic as relating to formal-ontological categories such as *object*, *state of affairs*, *unity*, *plurality*, and so on, is not an arbitrary one. In formal ontology, as in formal logic, we are able to grasp the properties of given structures in such way as to establish in one go the properties of all formally similar structures.[5] Then what is connection between emotion ontology and formal ontology? Professor Barry Smith mentioned every material in ontology presupposes a foundation in formal ontology, and this argument is the most beautifully stated in Bonaventure which one introduced Basic Formal Ontology (BFO).

(St. Bonaventure, Itinerarium mentis in Deum)The function of the intellective faculty consists in understanding the meaning of terms

... . Now, the intellect grasps the meanings of terms when it comprehends in a definition what a thing is. But definitions are constructed by using more universal terms; and these are defined by more universal terms until we come to the highest and most universal. Consequently, unless these latter are known, the less universal cannot be grasped in a definition.[6]

BFO is a small, upper-level ontology that is designed for use in supporting information retrieval, analysis and integration in scientific and other domains. It is also a genuine upper ontology. BFO can be extended by other ontologies like Mental Functioning Ontology (MFO), Food Ontology (FoodOn), Human Interaction Network Ontology, and so on. Since we talk about emotion ontology, we extended the BFO with MFO before we extending it again with emotion ontology.

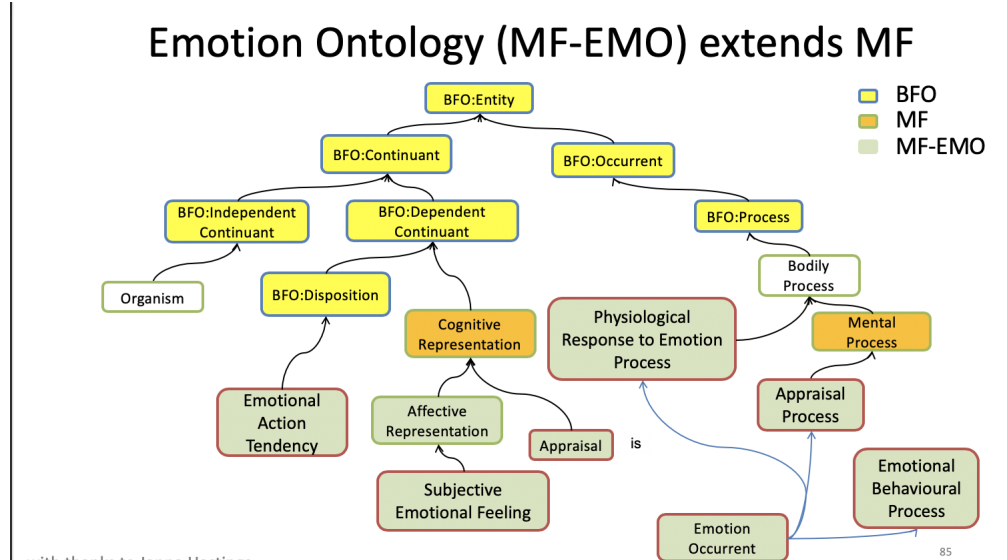


Figure 2: Emotion Ontology extended Mental Functioning Ontology which extended BFO

Then what is emotion ontology? Emotion Ontology is an ontology for affecting phenomena such as emotions and moods. It is being developed collaboratively between the Swiss Centre of Affective Sciences and the University at Buffalo. It was built on the Ontology of Mental Functioning (MFO) and the Basic Formal Ontology (BFO).[7]

Every emotion process involves 6 components: appraisal, subjective emotional feeling, physiological response to emotion, emotional action tendency, emotional Behavior and emotional personality trait.

2 Emotion Ontology Can Help Mining Social Media

Social Media provides rich information of human interaction and collective behavior, thus attracting much attention from disciplines including sociology, business psychology, politics, computer science, economics, and other cultural aspect of societies.[2]

There are several types of data that we can get in social media. The most common one is text data / textual data. With textual data we can analyze and mine the data, this is called as text mining or text analytics. The definition of text mining is to analyze information from textual data to discover patterns. From the text analytics, there are subtasks—components of a larger text-analytics effort—typically include information retrieval, named entity recognition, disambiguation, sentiment analysis, etc.

Emotion ontology takes a big part in subtask sentiment analysis. Sentiment analysis involves discerning subjective (as opposed to factual) material and extracting various forms of attitudinal information: sentiment, opinion, mood, and emotion. Text analytics techniques are helpful in analyzing sentiment at the entity, concept, or topic level and in distinguishing opinion holder and opinion object.[8]

From the definition above, sentiment analysis considers forms of attitudinal information which include emotion. From this fact, we can use emotion ontology to get information retrieval based on emotion.

Liviu-Adrian Cotfas et al.[9] Analyzed social networks sentiment analysis in Twitter to determine whether the message has a positive, negative or neutral connotation, without any information regarding the actual emotions use several ontology and emotion ontology was used for annotation tweets.

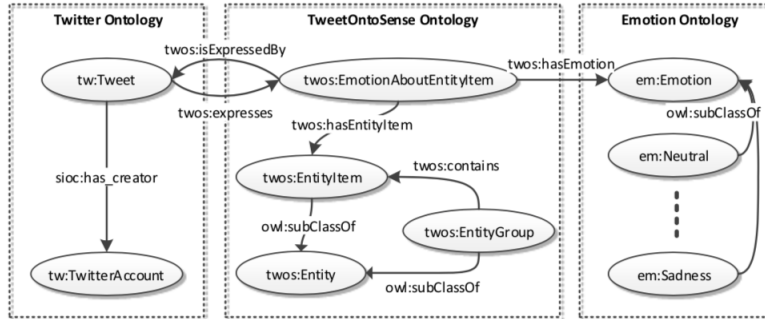


Figure 3: Ontology-based sentiment analysis

Erik Cambria et al.[10] used human emotion ontology(HEO) which has been developed in Ontology Web Language(OWL) and several different ontologies combined with sentic computing, one of opinion mining techniques, to mine use-

ful information to get people's expressions about commercial products in blogs, wikis, fora, chats and social networks/ social media.

Rung-Ching Chen et al.[11] used personal ontology which based on consumer's emotion and behavior analysis to identify social media users interest for personalized recommendations.

In other research, emotion ontology was used to see the sentiment analysis of reviews of electronic product in social networking / social media.[12] They start the ontology with class sentiment, which has the sub-classes *happiness* and *sadness*. Each of sub-class have keywords to define it like for *happiness*: *cool, great, awesome, fantastic, excited, perfect, etc*, while keywords for *sadness*: *bore, tired, frustrated, sad, disappointed, bad, etc*. The happiness and sadness keywords are organized as different levels of sub-classes under the happiness class based on the intensity level of *happiness* or *sadness*. The higher the subclass level, the higher the intensity level.

Mostly emotion ontology in mining social media is used to analyze the sentiment analysis or also know as opinion mining. Sentiment analysis or opinion mining can be used for measured in terms of customer satisfaction, issue resolution, quality improvement, better marketing, and a variety of other enterprise goals that go beyond profitability.[13]

Prof. Jan Wiebe of the University of Pittsburgh and colleagues in 2005 stated, "Sentiment analysis is the task of identifying positive and negative opinions, emotions, and evaluations." (Wiebe and colleagues recorded over 8,000 subjectivity clues — words and usage that indicate the presence of sentiment in natural language — which reinforces the complexity of the problem.)[13]

3 Conclusion

An emotion ontology is very possible and helpful for mining social media, mainly when we do opinion mining or sentiment analysis in which related with emotion. Emotion ontology will help to define either the data or information, whether containing emotion or not and define the level of emotion. There are various kind of emotion, but in general, they are categorized into 3: happy, sad and neutral; where happy is more positive, sad is more negative and neutral is in between. The result of all can be used for customer satisfaction, issue resolution, quality improvement, better marketing and many more.

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